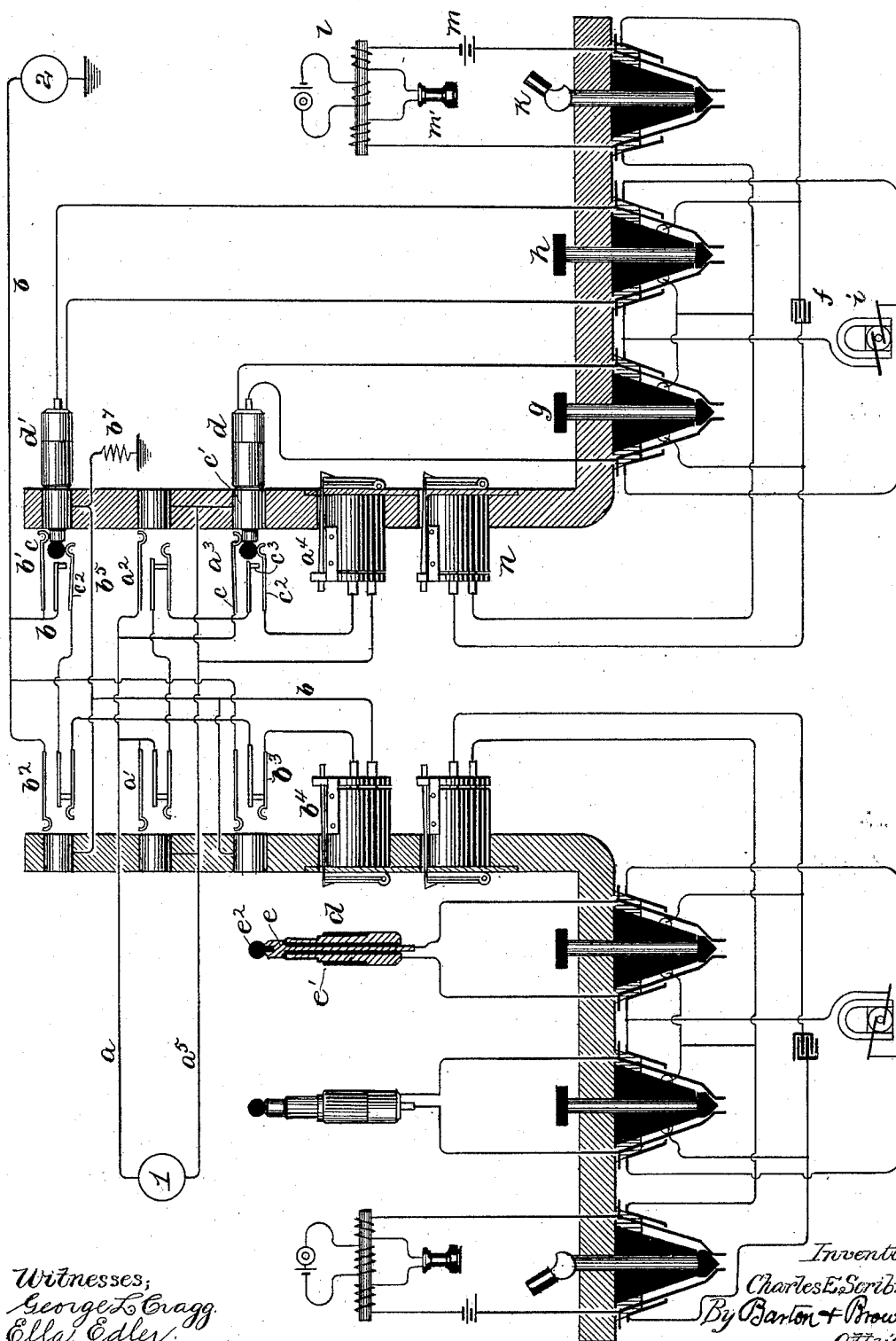


(No Model.)

C. E. SCRIBNER.
MULTIPLE SWITCHBOARD SYSTEM.

No. 487,096.

Patented Nov. 29, 1892.



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UNITED STATES PATENT OFFICE.

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MULTIPLE-SWITCHBOARD SYSTEM.

SPECIFICATION forming part of Letters Patent No. 487,096, dated November 29, 1892.

Application filed March 5, 1892. Serial No. 423,916. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SCRIBNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Multiple-Switchboard Systems, (Case No. 277,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to multiple-switchboard systems. Its objects are to provide a switchboard system in which few contacts are included in the line-circuit and a suitable test system therefor. Heretofore, commonly, the circuit from a sub-station has been completed at the exchange through the contact-points of a series of spring-jacks, one upon each board, thence through an individual annunciator, and returning to the sub-station. When a connection was made to the line by inserting a connecting-plug into a spring-jack, the contact-points of the spring-jack were separated, thus interrupting the circuit of the annunciator and completing the line-circuit through the contact-pieces of the connecting-plug and its connection, leaving, however, the contact-points of a number of the spring-jacks still in the line-circuit. My invention is designed to avoid the inclusion of contact-points in the line-circuit. I accomplish this end by employing spring-jacks, one for each circuit, upon each switchboard, each having a line-spring connected to one side of the circuit or line, a test ring or frame connected to the other line and an auxiliary spring normally resting against a contact-anvil, all the said auxiliary springs and anvils being connected in series in a branch circuit joining the two lines at the exchange and including the annunciator. Thus the complete circuit from the sub-station when not in use includes all the auxiliary springs and contacts and the annunciator, while the talking-circuit includes only the line-wires and the contacts of the plugs with the jack.

To establish connection with a line, I employ a connecting-plug of peculiar construction. It is provided with an insulated conducting-core adapted to make contact with the line-spring, a second insulated conduct-

ing-sleeve concentric with the first, adapted to make contact with the test-ring of the jack, and a spherical insulating-tip adapted to enter under the auxiliary spring and raise it from its contact-anvil when the plug is inserted into the jack.

The testing apparatus consists of a branch connection joining the different contact-pieces of a connecting-plug, including a battery and a telephone-receiver or other responsive device. When an operator desires to test to determine whether a connection already exists to a line at some other board, she thrusts the plug already described into the spring-jack of that line of her board. If the line be not in use, when the plug has been inserted to such a distance that the line-spring makes contact with the corresponding contact-piece of the plug a circuit will be completed from the battery through the test-ring of the jack tested, the series of auxiliary springs and their contacts, and the annunciator to the line-spring of the jack tested, thence returning to the battery. The completion of this circuit will produce one click in the telephone of the operator testing. Then the farther insertion of the plug into the jack causes the auxiliary spring to be raised, thus breaking the circuit and producing a second click in the telephone. If, however, the line be already in use, the circuit of the test-battery will not be completed at any time, since it is open at the auxiliary spring of the jack at which connection already exists. That sleeve or contact-piece of the plug which makes contact with the line-spring is preferably constructed of smaller diameter than that of the test-ring, so that the two contact-pieces of the plug may not make contact with the test-ring as the plug is inserted into the jack.

My invention is illustrated in the accompanying drawing. Therein I have shown a multiple-switchboard system comprising apparatus arranged in accordance with my invention and two sub-stations connected by lines to the exchange. The apparatus at the sub-station is all of the usual character and need not be described. Upon the switchboards are shown the spring-jacks described. Each consists, as appears at a^3 , of a line-spring c , a test-ring c' , and an auxiliary spring

and its contact-anvil $c^2 c^3$. The line-circuit from station 1 may be traced over line a to the line-springs of jacks $a' a^2 a^3$ at the first and second boards and over line a^5 to the test-rings of the same jacks. A conductor is connected to the line a and extends to line a^5 , including in series the auxiliary springs and contacts of each of the jacks $a' a^2 a^3$ and the annunciator a^4 . The circuit to station 2 is shown as grounded. It extends over line b to line-springs of line-jacks $b' b^2$ at the second and first boards, respectively, and to answering-jack b^3 . The return is through conductor b^5 , resistance b^7 , and earth to station. A branch similar to that traced before joins lines b and b^5 through the auxiliary springs and contacts of jacks $b' b^2 b^3$ and annunciator b^4 .

Connection between two lines is effected by means of connecting-plugs $d d'$. The plug d at the first board is shown in longitudinal section, disclosing its construction. It consists of a central conducting-core e and a conducting-sleeve e' , concentric with the core and insulated therefrom, and a spherical insulated tip e^2 . The sleeve e' is adapted to make contact with a test-ring of a jack and the core e with the line-spring. The contact-point of the core is of less diameter than the sleeve, as described, in order to avoid making contact with the test-rings as the plug is inserted into the jack. The tip e^2 serves to raise the auxiliary spring c^2 and is constructed of such proportion that it shall not raise the auxiliary spring until the piece c has made contact with the line-spring of the jack. Corresponding contact-pieces of the plugs $d d'$ are electrically connected together, the cores through a condenser f and the sleeves directly. The contact-points of the two calling-keys $g h$, of usual construction, are included in the conductors joining plugs $d d'$, whereby when either key is depressed both contact-pieces of one plug are disconnected from those of the other and are connected to the two poles of a calling-generator i . Branch connections extend from the same conductors to the contacts of a listening-key k , which is adapted to connect the terminals of the operator's telephone set l and test-battery m to the extremities of the branches when the key is depressed. Other branches extend to the terminals of a clearing-out annunciator n in the usual manner. Circuit to sub-station 1 being in its normal condition, suppose that the subscriber at that station sends a call-signal to the exchange. The current finds circuit over line a through the auxiliary springs and contacts and the annunciator a^4 , returning by line a^5 . The shutter of annunciator a^4 is thrown down, notifying the operator that a connection is desired. She inserts plug d in answering-jack a^3 at her board and depresses key k , thereby looping her telephone into the circuit to sub-station 1. Having learned the order—say for a connection with station 2—she at once inserts plug d' into jack

b' of that line at her board. If the line be not in use, when the line-spring c makes contact with the contact-piece e the circuit of battery m is completed through the piece e , spring c , conductor b , thence through the auxiliary springs and contacts of the jacks $b' b^2 b^3$ and the annunciator b^4 to test-ring c' , thence to the other contact-piece of plug d' and to battery, and a click or other characteristic signal is produced in the telephone m' . Then as the plug d' is farther inserted into the spring-jack the auxiliary spring c is raised from its contact-anvil by the tip e , breaking the circuit just formed and causing another sound in telephone m' . Obviously if the circuit to station 2 had been in use the test-circuit just traced would have been already opened at the spring-jack at which the prior connection existed and no sound would be produced in telephone m' . Thus the occurrence to two responses in telephone m' as she inserts plug d' into the jack of a line called indicates to the operator that the line is not in use, while the absence of any sound indicates that it is busy. When the plug d' is in place in jack b' , the circuit between the two subscribers includes only the lines, the contacts of the spring-jack with the contact-pieces of the plugs, and the conductors joining the two plugs. It will be observed that the circuits of the annunciators of both lines so connected are open. When conversation is finished, either subscriber may send a clearing-out signal, to which neither of the individual annunciators can respond, but which will operate the clearing-out annunciator n , thus notifying the operator that she may disconnect the lines.

Obviously any other responsive device might be used in place of or in addition to telephone m' to give a visible or an audible signal.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A connecting-plug consisting of a central conducting-core, a conducting-sleeve concentric with and insulated from said core and of such length as to leave a portion of said core exposed, and an insulated tip secured to said core, substantially as described.

2. The combination, with a spring-jack having a line-spring and a test ring or frame insulated therefrom and an auxiliary spring and contact-anvil insulated from both line-springs and test-rings, of a plug having one contact-piece making contact with the test-ring and another contact-piece making contact with the line-spring and an insulated tip entering under one end of the auxiliary spring and raising it from a contact-anvil, substantially as described.

3. The combination, with a telephone-line extending from a sub-station, of spring-jacks at a central-station, each consisting of a line-spring, a test-ring insulated therefrom, and auxiliary springs and contact-anvils, as described, said line-springs and test-rings being

connected with the two sides of line, respectively, and a conductor joining the two sides, including in series an annunciator and all the auxiliary springs and contacts, substantially
5 as specified.

4. The combination, with a line-circuit extending from a sub-station to switchboards at a central station and connected at each board to a spring-jack having a test-ring, a line-spring insulated therefrom, and an auxiliary
10 spring and contact, said line-springs and test-rings being connected to the sides of line, respectively, and said auxiliary springs and contacts being normally included in series
15 with an annunciator in a branch connection

between the two sides, of a plug inserted into one jack, having contact-pieces making contact with the test-ring and the line-spring of the jack, respectively, and a tip separating the auxiliary spring from its anvil, and a test-battery and responsive device included in a
20 circuit between the two contact-pieces of the plug, substantially as described.

In witness whereof I hereunto subscribe my name this 12th day of February, A. D. 1892.

CHARLES E. SCRIBNER.

Witnesses:

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